QUARTERLY JOURNAL

OF THE

Royal Meteorological Society

Editor
P. R. JONAS

Vol. **112**, 1986

ROYAL METEOROLOGICAL SOCIETY
JAMES GLAISHER HOUSE, GRENVILLE PLACE,
BRACKNELL, BERKSHIRE RG12 1BX

CONTENTS OF VOLUME 112

PAGE

J. D. WOODS and W. BARKMANN—The response of the upper ocean to solar heating. I. The mixed layer 1

J. D. WOODS and V. STRASS—The response of the upper ocean to solar heating. II. The wind-driven current 29

G. REVERDIN, D. L. CADET and D. GUTZLER—Interannual displacement of convection and surface circulation over the equatorial Indian Ocean 43

A. E. GILL and P. J. PHLIPS—Nonlinear effects on heat-induced circulation of the tropical atmosphere 69

SHOU-JUN CHEN and LORENZO DELL'OSSO—Numerical experiments on the sensitivity of the monsoon circulation to the differential heating 93

D. J. CARRUTHERS and T. W. CHOULARTON—The microstructure of hill cap clouds 113

T. W. CHOULARTON, I. E. CONSTERDINE, B. A. GARDINER, M. J. GAY, M. K. HILL, J. LATHAM and I. M. STROMBERG—Field studies of the optical and microphysical characteristics of clouds enveloping Great Dun Fell 131

D. J. GRIGGS and T. W. CHOULARTON—A laboratory study of secondary ice particle production by the fragmentation of rime and vapour-grown ice crystals . . 149

ANNE F. DE BAAS, HAN VAN DOP and FRANS T. M. NIEUWSTADT—An application of the Langevin equation for inhomogeneous conditions to dispersion in a convective boundary layer. 165

K. ARPE and E. KLINKER—Systematic errors in the ECMWF operational model in mid-latitudes 181

A. C. L. LEE—An experimental study of the remote location of lightning flashes using a VLF arrival time difference technique 203

P. L. READ—Super-rotation and diffusion of axial angular momentum. I. 'Speed limits' for axisymmetric flow in a rotating cylindrical fluid annulus 231

P. L. READ—Super-rotation and diffusion of axial angular momentum. II. A review of quasi-axisymmetric models of planetary atmospheres. 253

Notes and Correspondence

J. W. DEARDORFF—Comments on 'Radiative cooling near the top of a cloudy mixed layer' by F. T. M. Nieuwstadt and J. A. Businger (October 1984, **110**, 1073–1078). Reply by F. T. M. Nieuwstadt and J. A. Businger 273

H. A. RIPHAGEN and A. P. BURGER—Comments on the computational stability of Gadd's adjustment and advection schemes for a split explicit model 276

A. COURT—Comments on 'A new formula for latent heat of vaporization of water as a function of temperature' by B. Henderson-Sellers (October 1984, **110**, 1186–1190). Reply by B. Henderson-Sellers 283

A. LECLUYSE and J. NEUMANN—On the local rate of turning of wind direction . . 285

Reviews

Radiation in a cloudy atmosphere. Ed. E. M. Feigelson (A. Slingo); *Historical monitoring*. MARC Report No. 31 (H. H. Lamb); *The Climatic Scene*. Ed. M. J. Tooley and G. M. Sheail (S. C. B. Raper); *Climate Impact Assessment—Studies of Climate and Society*. Ed. R. W. Kates, J. H. Ausubel and M. Berberian (R. S. Scorer) . . . 289

Obituary notice 292

MICHAEL J. REEDER and ROGER K. SMITH—A comparison between frontogenesis in the two-dimensional Eady model of baroclinic instability and summertime cold fronts in the Australian region 293

QIN XU—Conditional symmetric instability and mesoscale rainbands 315

T. W. CHOULARTON and S. J. PERRY—A model of the orographic enhancement of snowfall by the seeder–feeder mechanism 335

C. A. WILSON and J. F. B. MITCHELL—Diurnal variation and cloud in a general circulation model 347

A. SLINGO and R. C. WILDERSPIN—Development of a revised longwave radiation scheme for an atmospheric general circulation model. 371

L. J. GRAY and J. A. PYLE—The semi-annual oscillation and equatorial tracer distributions 387

TABLE OF CONTENTS

PAGE

B. C. WEARE—A simple model of the tropical atmosphere driven by a circulation-dependent forcing 409

S. NICHOLLS and J. LEIGHTON—An observational study of the structure of stratiform cloud sheets. Part I: Structure 431

S. NICHOLLS and J. D. TURTON—An observational study of the structure of stratiform cloud sheets. Part II: Entrainment 461

DAVID P. ROGERS and JAMES W. TELFORD—Metastable stratus tops 481

JOHN A. T. BYE—Momentum exchange at the sea surface by wind stress and under-stress 501

D. J. THOMSON—A random walk model of dispersion in turbulent flows and its application to dispersion in a valley 511

T. A. HILL and T. W. CHOULARTON—A model of the development of the droplet spectrum in a growing cumulus turret 531

Notes and Correspondence

JAMES W. TELFORD—Comment on 'Microphysical properties of supercooled cumulus clouds in which an ice particle multiplication process operated' S. C. Mossop (January 1985, **111**, 183–198). Reply by S. C. Mossop 555

Reviews

Facets of Hydrology: II. Ed. by J. C. Rodda (D. H. Rees); *Handbook of Applied Meteorology*. Ed. by David D. Houghton (D. M. Houghton); *Physical Meteorology*. By Henry G. Houghton (C. J. Readings); *Black Carbon in the Environment*. By Edward D. Goldberg (R. M. Harrison) 561

A. GILCHRIST—Long-range forecasting 567

E. C. KUNG and W. E. BAKER—Comparative energetics of the observed and simulated global circulation during the special observing periods of FGGE 593

T. N. PALMER and D. A. MANSFIELD—A study of wintertime circulation anomalies during past El Niño events, using a high resolution general circulation model. I: Influence of model climatology 613

T. N. PALMER and D. A. MANSFIELD—A study of wintertime circulation anomalies during past El Niño events, using a high resolution general circulation model. II: Variability of the seasonal mean response 639

R. BENZI, P. MALGUZZI, A. SPERANZA and A. SUTERA—The statistical properties of the general atmospheric circulation: observational evidence on a minimal theory of bimodality 661

A. K. BETTS—A new convective adjustment scheme. I: Observational and theoretical basis 677

A. K. BETTS and M. J. MILLER—A new convective adjustment scheme. II: Single column tests using GATE wave, BOMEX, ATEX and arctic air-mass data sets . . 693

HUW C. DAVIES and C. J. SCHAR—Diabatic modification of airflow over a mesoscale orographic ridge: a model study of the coupled response 711

GREG HOLLAND and LANCE M. LESLIE—Ducted coastal ridging over south-east Australia 731

A. A. WHITE—Finite amplitude, steady Rossby waves and mean flows – analytical illustrations of the Charney–Drazin non-acceleration theorem 749

I. E. GALBALLY, C. R. ROY, R. S. O'BRIEN, B. A. RIDLEY, D. R. HASTIE, W. F. J. EVANS, C. T. MCELROY, J. B. KERR, R. A. PLUMB, P. HYSON and J. E. LABY—Trace constituents in the Austral stratosphere 775

C. A. REDDY, C. RAGHAVA REDDI and K. G. MOHANKUMAR—Zonal wind components in the stratosphere and troposphere over India 811

A. L. M. GRANT—Observations of boundary layer structure made during the KONTUR experiment 825

GARY D. EGBERT and MARCIA B. BAKER—Multiple state stochastic models for the long-range transport and removal of atmosphere tracers 843

J. WIERINGA—Roughness-dependent geographical interpolation of surface wind speed averages 867

PAGE

Notes and Correspondence

D. J. THOMSON—On the relative dispersion of two particles in homogeneous stationary turbulence and the implications for the size of concentration fluctuations at large times 890

Reviews

Turbulence and diffusion in stable environments. Ed. by J. C. R. Hunt (S. Nicholls); *Spherical harmonics and tensors for classical field theory*. By M. N. Jones (M. Blackburn); *Turbulence in the ocean*. By A. S. Monin and R. V. Ozmidov (S. A. Thorpe); *Dynamic Meteorology*. By S. Panchev (A. J. Thorpe) 895

Obituary notice. 898

TERRY L. CLARK, THOMAS HAUF and JOACHIM P. KUETTNER—Convectively forced internal gravity waves: Results from two-dimensional numerical experiments . . 899

DJURO RADINOVIĆ—On the development of orographic cyclones 927

J. F. B. MITCHELL and T. S. HILLS—Sea-ice and the antarctic winter circulation: A numerical experiment 953

W. M. CUNNINGTON and P. R. ROWNTREE—Simulations of the Saharan atmosphere—dependence on moisture and albedo 971

T. N. PALMER, G. J. SHUTTS and R. SWINBANK—Alleviation of a systematic westerly bias in general circulation and numerical weather prediction models through an orographic gravity wave drag parametrization 1001

G.-X. WU and A. A. WHITE—A further study of the surface zonal flow predicted by an eddy flux parametrization scheme 1041

F. PRODI, G. SANTACHIARA and A. FRANZINI—Properties of ice accreted in two-stage growth 1057

F. PRODI, L. LEVI and P. PEDERZOLI—The density of accreted ice . . . 1081

F. PRODI, L. LEVI and V. LEVIZZANI—Ice accretions on fixed cylinders . . . 1091

C. R. NAGARAJA RAO and T. TAKASHIMA—Solar radiation anomalies caused by the El Chichon volcanic cloud: Measurements and model comparisons . . . 1111

R. L. JONES, J. A. PYLE, J. E. HARRIES, A M. ZAVODY, J. M. RUSSELL III and J. C. GILLE—The water vapour budget of the stratosphere studied using LIMS and SAMS satellite data 1127

D. A. MANSFIELD—The skill of dynamical long-range forecasts, including the effect of sea surface temperature anomalies 1145

A. C. LORENC—Analysis methods for numerical weather prediction . . . 1177

PHILIP J. RASCH—Towards atmospheres without tops: Absorbing upper boundary conditions for numerical models 1195

WOLFGANG SPIRKL and HARALD RIES—Non-stationary Markov chains for modelling daily radiation data 1219

I. N. JAMES and L. J. GRAY—Concerning the effect of surface drag on the circulation of a baroclinic planetary atmosphere 1231

Notes and Correspondence

R. W. LUNNON—On the consequences of non-negative absolute vorticity . . . 1251

D. J. GRIGGS and T. W. CHOULARTON—The effect of rimer surface temperature on ice splinter production by the Hallett-Mossop process 1254

Reviews

Weather. By B. W. Atkinson, and *Water*. By E. C. Penning-Rowsell and D. J. Parker (R. Whyman); *The Ocean Surface; wave breaking, turbulent mixing and radio probing*. Ed. by Y. Toba and H. Mitsuyasu (S. A. Thorpe); *Issues in Atmospheric and Ocean Modelling. Part B. Weather Dynamics*. Ed. by S. Manabe (M. J. P. Cullen); *Climate and Circulation of the Tropics*. By Stefan Hastenrath (J. Mitchell) 1257

Obituary notice. 1262

Index 1263